



## Comparative Study of Arthroscopic ACL Reconstruction with Peroneus Longus Autograft vs Hamstring Autograft

Authors

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### Introduction

The ACL is 1 of 4 main ligaments in the knee. Ligaments are rope-like structures that connect and hold the bones together to keep the knee stable.

There are two components of the ACL, the anteromedial bundle (AMB) and the posterolateral bundle (PLB).

The ACL has a microstructure of collagen bundles of multiple types (mostly type I) and a matrix made of a network of proteins, glycoproteins, elastic systems, and glycosaminoglycans.

The ACL is innervated by posterior articular branches of the tibial nerve and is vascularized by branches of the middle genicular artery.

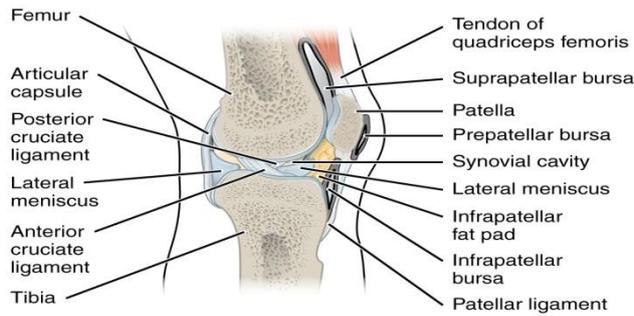
Anterior cruciate ligament (ACL) reconstruction improves knee stability and function.

Phatama et al. reported that there was no significant difference between the peroneus longus and hamstring tendon in terms of tensile strength.

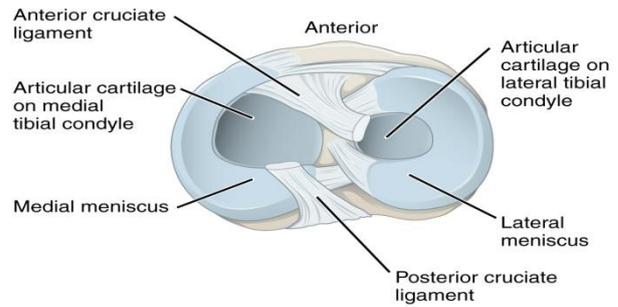
Peroneus longus tendon autografts are commonly used in some orthopedic procedures, including spring ligament reconstruction, deltoid ligament reconstruction and medial patellofemoral ligament reconstruction.

This is possible, due to the synergistic function of the peroneus longus and peroneus brevis.

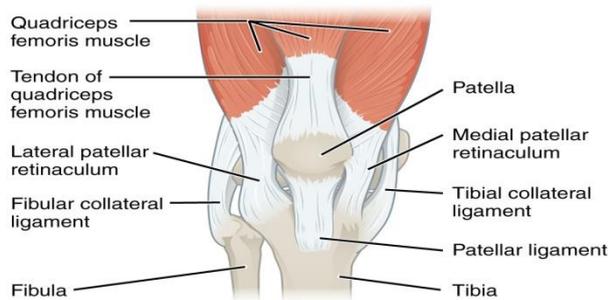
Some studies have even found that the peroneus brevis is a more effective evertor of the ankle, justifying the harvest of the peroneus longus tendon.



(a) Sagittal section through the right knee joint



(b) Superior view of the right tibia in the knee joint, showing the menisci and cruciate ligaments



(c) Anterior view of right knee

**Purpose of Study**

The purpose of this study is to compare the functional outcome and donor site morbidity between the peroneus tendon and hamstring tendon in ACL reconstruction.

**Materials and Method**

**Type of Study:** Case series prospective observational study.

20 patients underwent single bundle ACL reconstruction from 2022 to 2023.15 with Peroneus longus autograft and 5 with hamstring autograft.

All patients received only isolated ACL reconstruction between March 2022 and February 2023.

**Inclusion Criteria:**

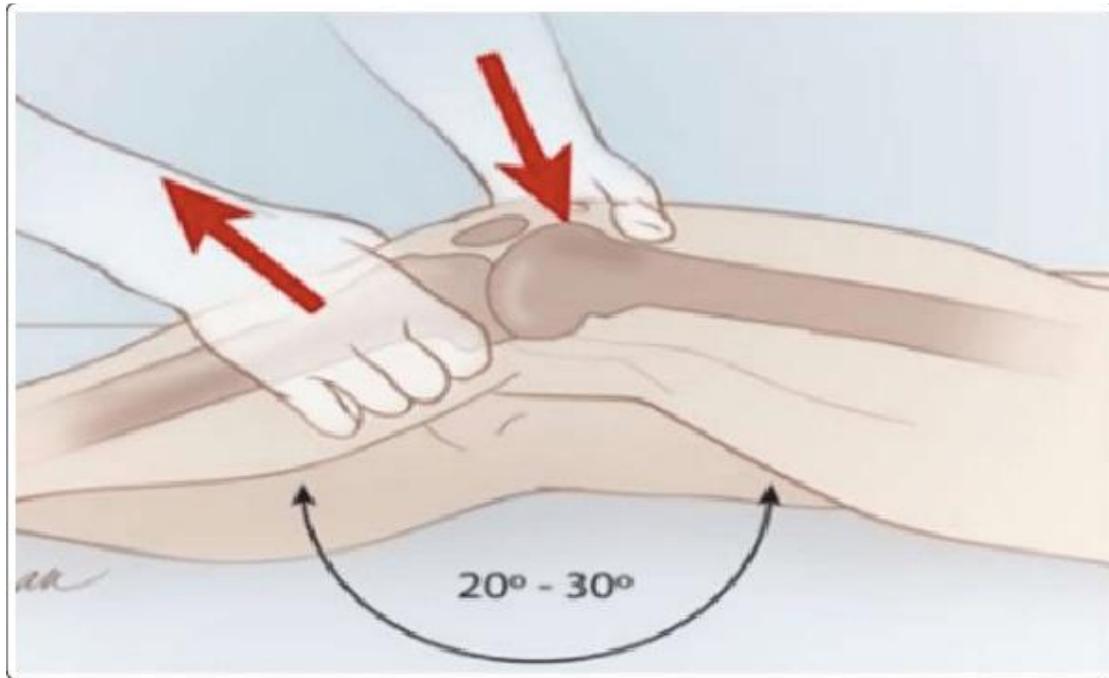
- Isolated rupture of ACL
- Age group 16-45 years.

**Exclusion Criteria:**

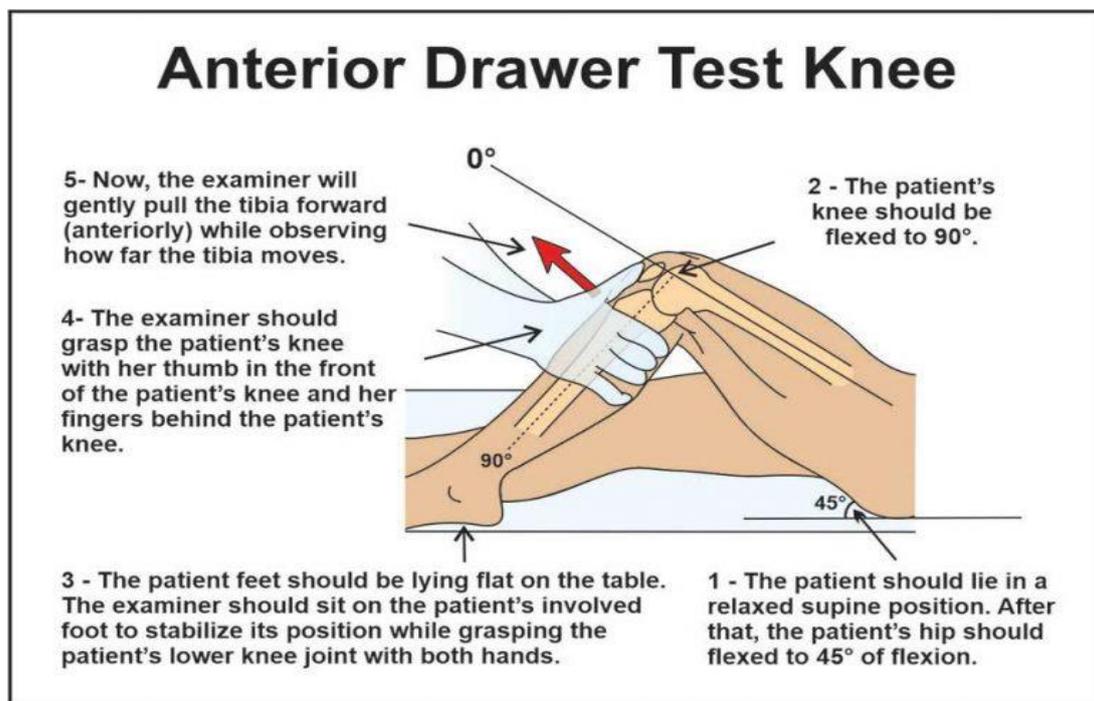
- Associated ligament injury, chondral damage, meniscal injury, fracture around the knee and presence of a pathological condition in the lower extremity or an abnormal contralateral knee joint.
- The functional score (IKDC, lysholm ) was recorded before and after 3 to 6 months of surgery.



**Lachman's Test:** The Lachman test can be useful if the knee is swollen and painful.

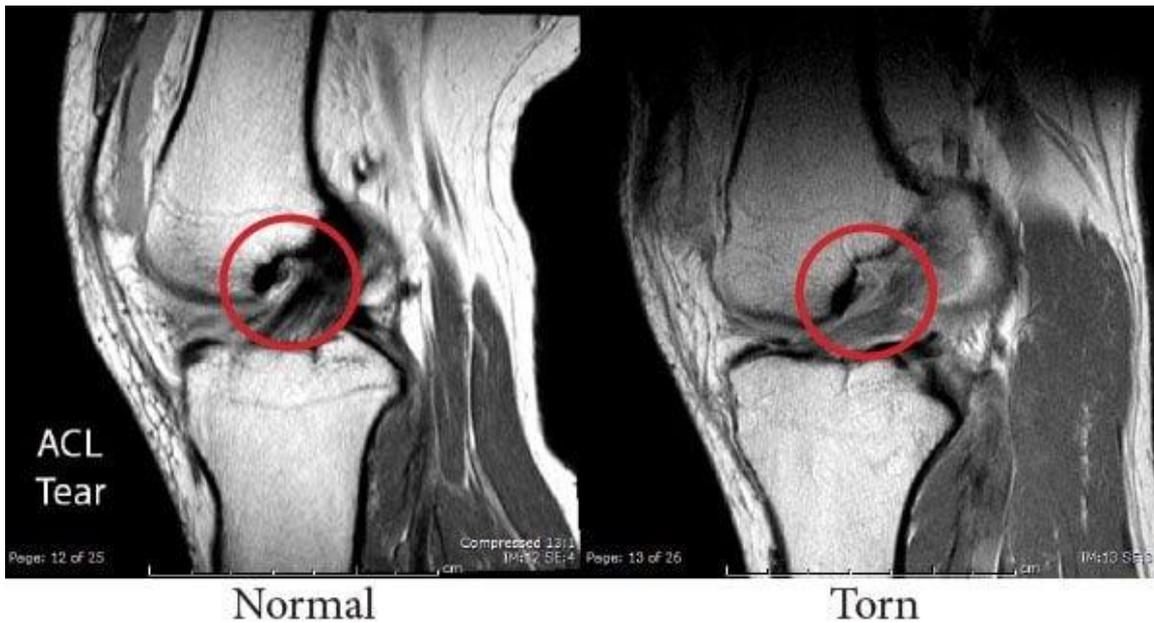


- Grade 1:** 3-5 mm translation
- Grade 2:** 5-10mm translation
- Grade 3 :** > 10mm translation



- Grade I – 5 mm
- Grade II – 5-10 mm
- Grade III - > 10 mm

Increased tibial displacement with the foot in neutral indicates a positive test which is graded by severity.



**Operative Procedure:**

Patients laid supine under spinal or general anesthesia, and a tourniquet was applied to the thigh.

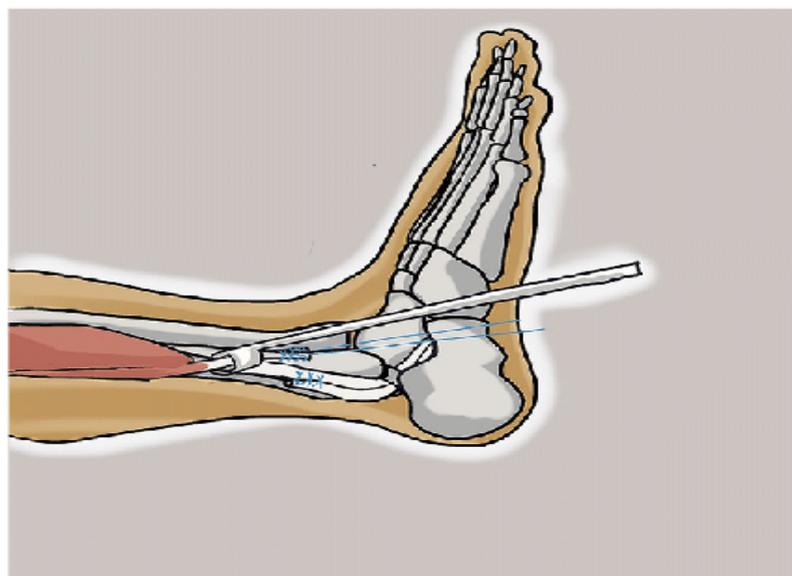
At first anterior portals were made, then diagnostic arthroscopy of the knee was performed. Graft harvesting (hamstring or peroneus longus) was done.

Tibial and femoral tunnels made and the graft was fixed.

The peroneus longus tendon was harvested with a 2 cm longitudinal skin incision at the posterolateral side of the fibula just over the

peroneus tendon, 2-3 cm proximal to the posterior border of the lateral malleolus in ipsilateral leg. After exposing the distal peroneus longus, a stripper was used to harvest the tendon to about 4–5 cm below the fibular head to avoid peroneal nerve injury. Then both peroneus tendons were sutured distally.

The superficial fascia and fat of the harvested tendon were removed, and the rough edge was trimmed carefully. The tendon was doubled up longitudinally through the middle to obtain a 2-strand autograft, and its ends were whip-stitch.

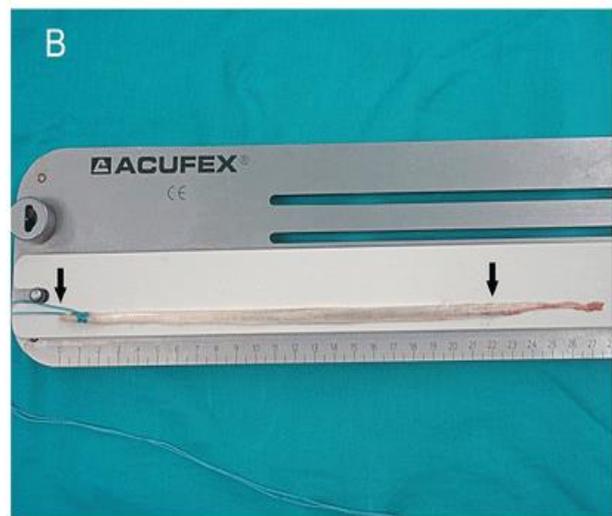
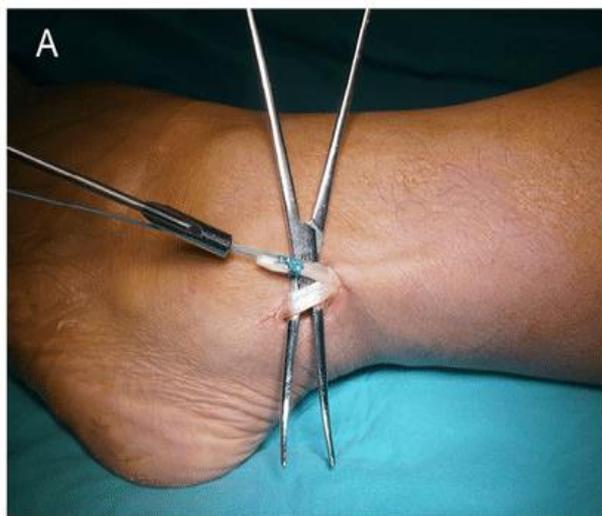




**Hamstring tendon harvesting**

In the hamstring group, a 3 cm oblique skin incision was made over the anteromedial aspect of the proximal tibia over the pes anserinus on the ipsilateral side.

Both the semitendinosus and gracilis tendons were harvested using an open tendon stripper. The tendons were then folded to form a 4-strand hamstring graft, and both ends were secured with whipstitch suture.



**Autograft fixation**

The intraarticular surgical technique was identical. The femoral tunnel and the tibial tunnel were drilled independently in anatomical position, and implantation of the tendon was performed.

The prepared autograft tendon was implanted, and femoral fixation was achieved with TightRope. Tibial side fixation was achieved with a BioScrew one size bigger than the tibial tunnel diameter.

**Rehabilitation**

Patients were discharged with the knee immobilizer the day after the surgery. Both groups were treated with the standard postoperative protocol for ACLR.

Knee extension and ankle pump exercises began immediately after surgery.

The first 2 weeks allowed partial weightbearing and a motion range of 0 to 90 degrees.

Full flexion was obtained within 5 to 6 weeks, and the full weightbearing exercise was allowed at least 3 to 4 weeks after the surgery.

Running was permitted after 3 to 4 months, and returning to sports activity was recommended after completing functional outcome tests 6 to 9 months after the operation

**Demographic Data**

	Peroneus longus tendon (n=20)	Hamstring tendon(n=20)
AGE(years)	29.80+/-7.5years	27.60+/-8.5years
BMI(kg/cm2)	26.6+/-3.2	27.9+/-2.5
FOLLOW UP(months)	6.2+/-3.2	5.8+/-2.8

GRAFT	DIAMETER(mm)	P value
Peroneus longus	8.71+/-0.4	<0.001
hamstring	7.65+/-0.6	<0.001

	Preoperative	Last follow-up (3-6 months)	Score change (percent)	P-value
IKDC	Peroneus L 55.2±2.4	82.5±9.8	27.3	<0.001
	Hamstring 54.8±8.5	81.4±6.2	26.6	
	P-value 0.96 (n.s)	0.689 (n.s)		
Lysholm	Peroneus 63.5±11.2	85.1±6.2	21.6	<0.001
	Hamstring 62.2±7.3	83.9±10.5	20.7	
	P-value 0.94 (n.s)	0.622 (n.s)		

**Result**

A total of 20 patients 15P/5H patients respectively, were evaluated with a minimum follow-up of 3-6 months.

Both groups showed no significant differences in clinical outcomes and knee stability.

The peroneus longus graft diameter was significantly larger than the hamstring diameter.

Hamstring has unpredictable graft size and a potential decrease in hamstring power, which is crucial for some athletes who need dominant hamstring power.

Assessment of AOFAS, FADI, and ankle ROM showed no apparent ankle joint dysfunction in the peroneus longus tendon group.

**Discussion**

In our study, we used PLT graft and HT graft to replace the injured ACL. Surprisingly, the diameter of the PLT graft was around 8.5 mm, which was larger than the ideal in diameter so the reconstruction could be performed rapidly.

Magnussen et al. stated the ideal minimum graft diameter of 7 mm is best to avoid revision surgery.

Other studies affirmed that a graft diameter of no less than 8 mm is the acceptable range for reconstruction.

Comparative studies on the use of HT and PLT grafts showed no significant differences between the pre- and 1-year post-surgery, based on the IKDC, modified Cincinnati, and Lysholm Knee Scoring Scale.

A comparative study of the ankle eversion and first ray plantarflexion strength on the donor site vs. contralateral site at 6-month post-surgery revealed no significant differences. Furthermore, the FADI and AOFAS scores at the donor site were excellent. These findings were similar to our patient, who could perform tip-toe walking with no ankle and foot function limitation after reconstruction.

He et al. concluded that the PLT graft is suitable as an autograft harvested outside the knee to avoid the complication of quadriceps-hamstring imbalance that may occur after harvesting the graft from the knee.

Regardless of all the advantages of PLT grafts in ACL reconstruction, the graft preference was decided based on various clinical considerations by the surgeons including the associated meniscal and ligament lesions, high or low demand patient's activities, medical condition or comorbidities, pre-surgical status, patient decision, and the post-operative rehabilitation protocol.

### Conclusion

Faster knee extensions, less anteromedial knee pain, and thigh hypotrophy were observed in peroneus longus tendon patients.

Single-bundle ACL reconstruction with peroneus longus tendon autografts had an excellent functional outcome, donor site morbidity and showed comparable results to the four-strand hamstring tendon.

Peroneus longus tendon autograft avoid potential complications of hamstring autograft obtained from the knee region.

### References

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